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of Emory University, the building to be known as the J. J. Gray Clinic.

ORSON BENNETT JOHNSON, professor emeritus of zoology in the University of Washington, has given the university his valuable entomological collection.

DR. J. ERNEST CARMAN, of the University of Cincinnati, has been appointed to the chair of geology at the Ohio State University vacant by the death of Professor Charles S. Prosser.

DR. JULIUS H. HESS has been appointed professor of pediatrics and head of the division of pediatrics in the University of Illinois, college of medicine.

DR. FRANK MALTAUER, formerly of the Cincinnati Board of Health, has become associate professor of bacteriology and public health at the College of Medicine, University of Tennessee.

DR. ALBAN STEWART, instructor in botany at the University of Wisconsin, has been appointed professor of botany and bacteriology in the Florida State College for Women, Tallahassee, Florida.

DR. R. L. BORGER, of the University of Illinois, has been appointed professor of mathematics at Ohio University, Athens, Ohio.

DR. EDWARD HART has retired as active head of the chemical department of Lafayette College, but remains connected with the department as professor of chemical engineering and as librarian of the Henry W. Oliver Chemical Library. Dr. Eugene C. Bingham has resigned the professorship of chemistry at Richmond College to become professor of chemistry and director of the Gayley Laboratory at Lafayette College. Last year Dr. Bingham was on leave of absence from Richmond College in order to carry out some special investigations at the Bureau of Standards on the subjects of fluidity and plasticity. Dr. J. Hunt Wilson, of Lehigh University, has become assistant professor of chemistry at Lafayette College.

J. F. WILSON, formerly instructor in electrical engineering at the University of Michigan, has been appointed professor of electrical engineering at Queen's University, Kingston, Canada, to take the work of Professor L. W. Gill, while the latter is in active military service.

DISCUSSION AND CORRESPONDENCE

SUNLIGHT AND THE MAGNETIC NEEDLE

THE editorial page of the *Electrical World* for April 1, 1916, contains the following paragraph pertaining to the subject of magnetism and terrestrial magnetism:

> Considering how many centuries have elapsed since magnetic phenomena first became recognized on this planet, it is remarkable how little has yet been learned concerning the nature and laws of magnetism. All that we are able to affirm, with a reasonable degree of certainty, is that whatever electricity and magnetism may be, they must be so interrelated that one is the consequence of the curl of the other, which is one aspect of Maxwell's electromagnetic theory.
>
> As an instance of our magnificent international ignorance of the nature of terrestrial magnetism, the simple historical fact may be cited that in 1582, the date of the international introduction of the Gregorian Calendar, with a sudden jump of ten days, the magnetic needle at London pointed 11 degrees easterly of the geographic meridian, whereas it now points nearly 16 degrees westerly of that meridian, and in 1820 nearly attained 25 degrees of westerly declination, a total of more than 36 degrees, while no satisfactory theory of the large change has yet been produced.

The foregoing is particularly interesting to the writer, who is directly interested in collecting ocean data on the non-magnetic ship *Carnegie* to be used, first, practically in constructing charts for navigation and, second, in theorizing on the causes of the earth's magnetism and on its changes as referred to. I desire to call attention to the work of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, D. C., in the making of extensive magnetic observations leading to the formation of some correct theory of the causes of the earth's magnetism.

The writer wishes to contribute the following on the general subject of magnetism, of whatever value it may be.

So far as I am aware neither Faraday in his experimental researches nor Maxwell in his mathematical treatment thereof, nor any one else recently, ever proposed or performed an experiment, excepting the experiments with polarized light, to show that a direct connection existed between light and magnetism.

At the end of Faraday's first period of brilliant discoveries or about 1841 various investigators[1] had performed many experiments with this end in view.

In general these had taken the form of attempts to magnetize bodies by exposure in particular ways to different kinds of radiations; and a successful result had been more than once reported only to be proven in error on reexamination.

Sir John Herschel was the first to indicate the true path of procedure. He wrote:

> Induction led me to conclude that a similar connection exists, and must turn up somehow or other, between the electric current and polarized light and that the plane of polarization would be deflected by magneto-electricity.

Faraday had already discovered the nature of this connection in 1834, but had considered his experiment a failure. In 1845 after Herschel's remark he varied the original experiment, with success, by placing a piece of heavy glass between the poles of an excited electromagnet; and found that the plane of polarization of a beam of light was rotated when the beam passed through the glass parallel to the magnetic lines of force composing the field. This constituted the discovery of the connection between light and magnetism.

In 1851 Faraday wrote:

> It is not at all unlikely that if there be an *æther*, it should have other uses than simply the conveyance of radiation.

This sentence has been considered the origin of the electro-magnetic theory of light.

The question which natural philosophers had never ceased to speculate on, that of the manner in which electric and magnetic influences are transmitted through space, assumed a definite form about the middle of the nineteenth century and issued in a rational theory. It was at this point that the whole matter was taken up and eventually theoretically solved by Maxwell. He said:

> We can scarcely avoid the inference that light consists in the transverse undulations of the same medium which is the cause of electric and magnetic phenomena.

At the time Maxwell did not examine whether this relation was confirmed by experiment. For years the electromagnetic theory was beset with difficulties and was unfavorably received by his most famous contemporaries. Helmholtz after many years accepted it, but Lord Kelvin, it seems, never did.

It is quite interesting to note here that Lord Kelvin in 1904 admitted that a bar magnet rotating about an axis at right angles to its length is equivalent to a lamp emitting light of period equal to the period of rotation, giving his final judgment, however, that "the so-called electro-magnetic theory of light has not helped us hitherto."

While pondering over the subject of terrestrial magnetism, electricity and magnetism on the night of Tuesday, March 7, 1916, the following thought came to me with such force that I set it down in my diary. A copy is as follows:

> I conceived the idea to try the effect of a concentrated sunlight on the magnetic needle or magnetized bar of any kind. The question being will not the concentrated light lessen or strengthen the magnetism of the magnet?

In performing such an experiment arrangement must be made so as to exclude the effects of the absorbed energy appearing as heat. I intended to try this as an experiment at some convenient time in the hopes that some new connection might be brought about concerning the subject of light, electricity and magnetism and their mode of propagation.

On Saturday, March 11, 1916, four days afterwards, I chanced to see a newspaper clipping regarding some work of Professor T. J. J. See, of Mare Island, Cal. In this article Pro-

[1] Morichini, of Rome, 1813, *Quart. Journal of Science*, XIX., p. 338. S. H. Christie, of Cambridge, 1825, *Phil. Trans.*, 1826, p. 219. Mary Somerville, 1825, *Phil. Trans.*, 1826, p. 132.

fessor See proposed to explain many things, among them being "the direct effect of sunlight on a magnetic needle, as in Nipher's experiment of 1913." This was a complete surprise. Evidently this experiment had been tried with success by I suppose Francis E. Nipher, of Washington University, St. Louis, Mo.

It seems to me that such an experiment would be valuable to science in many ways. The question arises as to the quantitative effect produced—if appreciable, then might we not expect or predict a change in all magnets more or less with time—especially as they are exposed to the sunlight? It is well known that magnets lose some of their magnetism during the process of ageing. Might this effect be a contributing cause?

The question as to the effect on small magnets such as in use for the determination of the earth's magnetic elements assumes some importance when considered in this regard.

What might be the effect of the sunlight on the magnet if it were rotated about a horizontal line through its center of mass and perpendicular to its magnetic axis? The theory of magnetization by rotation has been treated in two articles appearing recently in SCIENCE by Barnett.

Aside from the foregoing it would be interesting to note the effect, if any, of radioactive emanations upon a magnetic needle.

There are two well-known cases of the transformation of luminous into electrical energy, the thermopile and the photo-electric cell. However, in neither one is the transformation direct, as would be the case of luminous energy falling upon the magnetic needle.

It would be interesting to see this matter investigated in the light of modern electrical theory and to know of Nipher's experiment and of the results obtained.

F. C. LORING
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GUMBOTIL, A NEW TERM IN PLEISTOCENE GEOLOGY

THE term gumbo has been used for many years by some geologists in America for a dense, impervious clay, which, when saturated with water, is sticky and tenacious. The name has had no relation to the origin of the material: in many cases it has been applied to alluvial deposits on the flood plains of streams: McGee, Leverett and others have applied it to a gray to drab-colored clay overlying drift, the origin of the gumbo having been attributed to various causes, some having considered it to be, mainly, of fluvio-glacial origin, others to be aqueous, and still others have thought it to be related to loess.

In a recent paper in volume 27 of the Geological Society of America, pages 115 to 117, the writer discussed a gumbo which lies on Kansan drift and which he had studied in considerable detail in southern Iowa. This gumbo is limited in distribution to tabular divides and other remnants of the Kansan drift plain. The view was there expressed that the field evidence suggested strongly that the gumbo is the result, chiefly, of the chemical weathering of Kansan drift. It was stated, also, that detailed chemical analyses of the gumbo and the underlying materials were being made by Dr. J. N. Pearce, of the chemistry department of the University of Iowa, to ascertain whether the analyses would strengthen or weaken the interpretations made from the field evidence. These analyses have now been completed and will soon be published. They seem to show clearly that the gumbo is the weathered product of the drift.

During the present summer, the writer has extended his studies into the western, northwestern and northern parts of Iowa, and at scores of places sections have been examined which show clearly the intimate relations between the gumbo and the underlying Kansan drift. Moreover, it is of interest that in many places a gumbo has been found on the Nebraskan drift, the relations of the gumbo to this drift being similar to those of the super-Kansan gumbo to the Kansan drift. Furthermore, after a somewhat careful study of the gumbo which lies on the Illinoian drift in southeastern Iowa, and which has been discussed by Leverett in Monograph XXXVIII. of the United States Geological Survey,